

## CLAIMS

What is claimed is:

1           1.       A method for the detection of an analyte in a sample, which comprises  
2     contacting the sample to be tested with a three-dimensional array of a polydiacetylene  
3     backbone having a substrate incorporated in the array, wherein the substrate has direct  
4     affinity for the analyte or can function as a binder to the analyte or can react with the  
5     analyte;  
6           and detecting the change in fluorescence to indicate the presence of the analyte.

1           2.       The method of claim 1 wherein the array is in the form of a solution of  
2     liposomes or tubules.

1           3.       The method of claim 1 wherein the analyte is an enzyme and the substrate  
2     is a reactive substrate of that enzyme.

1           4.       The method of claim 1 or 2 wherein the analyte is an antigen and the  
2     substrate is the antibody of that antigen.

1           5.       The method of claim 1 or 2 wherein the analyte is an antigen and the  
2     substrate is a fragment of the antibody of that antigen.

1           6.       The method of claim 1 or 2 wherein the analyte is an antibody or antibody  
2     fragment and the substrate is the antigen of that antibody.

1           7.       The method of claim 1 or 2 wherein the analyte is an antibody or antibody  
2     fragment and the substrate is the epitope of that antibody.

1           8.       The method of claim 2 wherein the analyte is an enzyme and the substrate  
2     is a reactive substrate of that enzyme.

- 1                    9.        The method of claim 1 wherein the polydiacetylene of the array is in the  
2 non-fluorescent form, exhibiting a fluorescent signal that is about 1-3 times that of the  
3 background and less than that of the corresponding fluorescent form.

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1 10. The method of claim 1 wherein the substrate includes a ligand.

1 11. The method of claim 1 wherein the array is in the form of a solution of a  
2 liposome or tubule.

1 12. The method of claim 1 wherein the substrate includes a reactive substrate.

1 13. The method of claim 12 wherein the array is in the form of a solution of a  
2 liposome or tubule.

1 14. The method of any one of claims 1 to 13 wherein the three-dimensional  
2 array further comprises a fluorophore and wherein the change in fluorescence of the  
3 polydiacetylene array is monitored.

1 15. The method of any one of claims 1 to 13 wherein the three-dimensional  
2 array further comprises a fluorophore and wherein the change in fluorescence of the  
3 fluorophore is monitored.

1                   16.    The method of claim 1 wherein the array does not contain a further  
2   fluorophore.

1                   17.    The method of claim 1 wherein the change in fluorescence is detected by  
2   exposure to light having wavelengths below 550 nm and measurement of the emission.

1                   18.    The method of claim 1 wherein the change in fluorescence is detected by  
2   exposure to light having wavelengths between 450 and 500 nm and measurement of the  
3   emission.

1 19. The method of claim 1 wherein the polydiacetylene of the array exhibits  
2 fluorescence and the fluorescence increases as an indication of the presence of the  
3 analyte.

1 20. A method for the detection of an analyte in a sample which comprises  
2 contacting the sample to be tested with a two-dimensional array of a polydiacetylene  
3 backbone having a substrate incorporated in the array, wherein the substrate has direct  
4 affinity for the analyte or can function as a binder to the analyte or can react with the  
5 analyte and wherein the two-dimensional array comprises a polymerized diacetylene  
6 array wherein no more than 90% of the diacetylenes are terminated with groups that  
7 specifically bind to the analyte;  
8 and detecting the change in fluorescence to indicate the presence of the analyte.

1 21. The method of claim 20 wherein the two-dimensional array comprises a  
2 polymerized diacetylene array wherein no more than 60% of the diacetylenes are  
3 terminated with groups that specifically bind to the analyte.

1 22. The method of claim 20 wherein the array is coated onto a solid support.

1 23. The method of claim 22 wherein the solid support is a porous membrane.

1                   24.     The method of claim 20 wherein the array is unsupported.

1                   25.     The method of claim 20 which further comprises providing a filter or flow  
2 cell containing the array supported on or in a porous membrane; and passing a solution of  
3 the analyte through the filter or flow cell before or during the detect.

1                   26.     The method of claim 20 wherein the substrate includes a ligand.

1                   27.     The method of claim 26 wherein the array is on a nano-porous membrane.

1                   28.     The method of claim 20 wherein the substrate includes a reactive  
2 substrate.

1                   29.     The method of claim 28 wherein the array is on a nano-porous membrane.

1                   30.     The method of claim 20 wherein the two-dimensional array further  
2 comprises a fluorophore and wherein the change in fluorescence of the polydiacetylene  
3 array is monitored.

1                   31.     The method of claim 20 wherein the two-dimensional array further  
2 comprises a fluorophore and wherein the change in fluorescence of the fluorophore is  
3 monitored.

1 32. The method of claim 26 or 28 wherein the three-dimensional array further  
2 comprises a fluorophore and wherein the change in fluorescence of the polydiacetylene  
3 array is monitored.

1 33. The method of claim 26 or 28 wherein the three-dimensional array further  
2 comprises a fluorophore and wherein the change in fluorescence of the fluorophore is  
3 monitored.

1 34. The method of claim 20 wherein the array does not contain a further  
2 fluorophore.

1 35. The method of claim 20 wherein the change in fluorescence is detected by  
2 exposure to light having wavelengths below 550 nm and measurement of the emission.

1 36. The method of claim 20 wherein the change in fluorescence is detected by  
2 exposure to light having wavelengths between 450 and 500 nm and measurement of the  
3 emission.

1 37. The method of claim 20 wherein the polydiacetylene of the array exhibits  
2 fluorescence and the fluorescence increases as an indication of the presence of the  
3 analyte.

1 38. A method for the detection of an analyte in a sample which comprises  
2 contacting the sample to be tested with three-dimensional arrays of a polydiacetylene  
3 backbone having a substrate incorporated in the arrays, wherein the substrate has direct  
4 affinity for the analyte or can function as a binder to the analyte or can react with the  
5 analyte, and the arrays are suspended in solution; and detecting the change in polarization

6 of the fluorescence of the polydiacetylene arrays upon being excited with polarized light,  
7 to indicate the presence of the analyte.

1 39. The method of claim 38 wherein the three-dimensional arrays are  
2 liposomes.

1 40. The method of claim 38 or claim 39, wherein the substrate is an antibody  
2 and the analyte an antigen to that antibody.

1 41. The method of claim 38 or claim 39, wherein the substrate is an antibody  
2 fragment and the analyte an antigen to that antibody fragment.

1 42. The method of claim 38 or claim 39, wherein the analyte is immobilized  
2 onto a surface.

1 43. The method of claim 38 or claim 39 wherein the analyte is attached to a  
2 microbead.

1 44. The method of claim 38 or claim 39 wherein the analyte is attached to a  
2 macrobead.

1 45. The method of claim 38 wherein the three-dimensional arrays also contain  
2 fluorophores and the change in the polarization of the fluorophore emission upon the  
3 polydiacetylene array being excited with polarized light is detected to indicate the  
4 presence of the analyte.

1 46. The method of claim 45 wherein the three-dimensional arrays are  
2 liposomes.